

The application as filed contained claims 1 through 70. The Examiner indicated a restriction in which Group II is claim 53 and Group I is the remaining claims. Applicant hereby elects group I, namely claims 1-52 and 54-70. The election is without traverse, conditioned upon the Examiner examining all of claims 1-52 and 54-70.

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Claim 23 has been amended to recite a light-emitting diode. This is disclosed in the specification at paragraph 103.

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Claims 29, 37, 46 and 56 have been amended to recite that the substrate is made of a plastic material or made of glass. This is disclosed in the specification at paragraph 98.

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Claims 32, 40, 49 and 59 have been amended to recite that the waveguiding film comprises at least one layer of high refractive index or at least one polymer layer. This is disclosed in the specification at paragraph 97.

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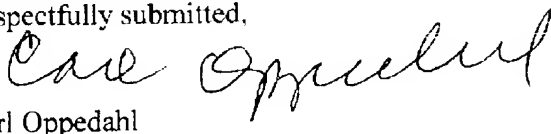
Claims 35, 44 and 54 have been amended to recite a waveguiding material rather than a waveguiding film. Waveguiding material is disclosed in the specification at paragraphs 13 and 52.

Claim 54 has been amended to recite zero-order and higher-order diffractions. This is disclosed in the specification at paragraph 86.

Forms PTO/SB/17 and PTO-2038 are attached, directed to the added claims 71-75.

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Respectfully submitted,



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## Separate sheet

1. An optical sensor for the characterization or the detection or the detection and characterization of [a] at least one chemical or bio-chemical substance comprising:

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at least one optical waveguide with a substrate, a waveguiding material, a cover medium and at least one waveguide grating structure,

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at least two sensing pads comprising at least one unidiffractive or multidiffractive grating, at least one of the sensing pads acting as sensor pad and comprising a sensor chemosensitive or bio-chemosensitive substance, and at least one of the sensing pads acting as reference pad and comprising a reference chemosensitive or bio-chemosensitive substance,

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light source means for the [simultaneous] illumination of gratings of the sensor pad and of the reference pad;

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detection means for detection of positions or of intensities or of positions and of intensities of at least two light distribution proportions, which, on the detection means, are not superimposed on one another and which are emitted or coupled out or emitted and coupled out from the waveguide grating structure into the substrate or into the cover medium or into the substrate and into the cover medium;

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means for the generation of a referenced sensor signal through the evaluation of the detected light distribution, of the detected positions or of intensities of the at least two light distribution proportions or of a combination of these.

23. The optical sensor according to claim 1, wherein said light source means comprises a laser diode or a light-emitting diode.

35. A sensor chip for the characterization or the detection or for the detection and characterization of [a] at least one chemical or bio-chemical substance, comprising at least one optical waveguide with a substrate, [a] waveguiding [film] material, and at least one waveguide grating structure, the substrate comprising a bottom,

5 and said waveguide grating structure being configured such as to form at least two sensing pads, each comprising a chemosensitive or biochemosensitive substance,

said waveguiding [film] material not being plane-parallel to the bottom of the substrate.

10 39. The sensor chip according to claim 35, wherein the waveguiding material is a waveguiding film [comprises] comprising at least one layer.

15 40. The sensor chip according to claim 39, wherein the waveguiding film comprises at least one layer of high refractive index or at least one polymer layer or at least one layer of a high refractive index and one polymer layer.

20 44. A sensor chip for the characterization or detection or for the detection and characterization of [a] at least one chemical or bio-chemical substance, comprising at least one optical waveguide with a substrate comprising a bottom, [a] waveguiding [film] material, and at least one waveguide grating structure,

25 and said waveguide grating structure forming at least two sensing pads, each comprising a chemosensitive or biochemosensitive substance,

each sensing pad comprising at least one in-coupling grating and at least one out-coupling grating,

the in-coupling gratings of the two sensing pads being arranged next to each other.

48. The sensor chip according to claim 44, wherein the waveguiding material is a waveguiding film [comprises] comprising at least one layer.

49. The sensor chip according to claim 48, wherein the waveguiding film comprises at least one layer of high refractive index or at least one polymer layer or at least one layer of a high refractive index and one polymer layer.

54. A sensor chip for the characterization or detection or the detection and characterization of [a] at least one chemical or bio-chemical substance, comprising at least one optical waveguide with a substrate, [a] waveguiding [film] material, and at least one waveguide grating structure, the substrate comprising a bottom, [a] waveguiding [film] material, and at least one waveguide grating structure,

and said waveguide grating structure being configured so as to form at least two sensing pads, each comprising a chemosensitive or biochemosensitive substance,

each sensing pad comprising one unidiffractive or multidiffractive grating for use in [reflection type measurements] a reflection type zero diffraction order or higher diffraction order arrangement or in a transmission type zero diffraction order or higher diffraction order arrangement or in a reflection and transmission type zero diffraction order or higher diffraction order arrangement.

58. The sensor chip according to claim 54, wherein the waveguiding material is a waveguiding film [comprises] comprising at least one layer.

59. The sensor chip according to claim [54] 58, wherein the waveguiding film comprises at least one layer of high refractive index or at least one polymer layer or at least one layer of a high refractive index and one polymer layer.

63. An optical process for the characterization or for the detection or the detection and characterization of [a] at least one chemical or bio-chemical substance in a specimen by means of a waveguide grating structure containing at least one waveguide grating structure unit, wherein the specimen is brought into contact with the waveguide structure in at least one contact zone comprising a sensor chemosensitive or bio-chemosensitive substance and a reference chemosensitive or bio-chemosensitive substance,

in the waveguide structure in the region of the at least one contact zone, [simultaneously] exciting at least two light waves through the waveguide grating structure unit or at least one grating of the sensor pad and one grating of the reference pad of the waveguide grating structure unit are illuminated [simultaneously], and bringing at least one light wave into interaction with the specimen,

wherein the light waves differ in at least one of their polarization, their mode number, their wavelength and of their position on the waveguide grating structure, or the sensor chemosensitive or bio-chemosensitive substance and the reference chemosensitive or bio-chemosensitive substance are different, or where at least one light wave is brought into interaction with a first specimen and a second light wave is brought into interaction with a second specimen;

detecting light in at least two differing proportions, which are not superimposed on the detection means and of which at least one proportion originates from the at least one contact zone,

generating at least one referenced measured signal by the evaluation of the detected light.